

Amendment and Response

Applicant: Jeffrey Allen Neilsen et al.

Serial No.: 10/603,896

Filed: June 24, 2003

Docket No.: 100201650-1

**Title: METHODS AND SYSTEMS FOR PRODUCING IMPROVED COLORING
IN AN OBJECT PRODUCED THROUGH SOLID FREEFORM FABRICATION**

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of the claims:

1. (Currently Amended) A method of improving color quality in an object created by a solid freeform fabrication system that uses a fluid ejection process to build successive layers of the object being fabricated, the method comprising:
| ejecting a first material to form a layer of a three-dimensional object, the first material
| containing a colorant; and
| causing a reaction that keeps the colorant near a surface of the object.
2. (Original) The method of claim 1, wherein causing a reaction comprises precipitating the colorant out of the first material.
3. (Original) The method of claim 2, wherein causing a reaction further comprises providing a second material to precipitate the colorant out of the first material.
4. (Original) The method of claim 3, wherein ejecting a first material comprises ejecting a binder.
5. (Original) The method of claim 4, wherein providing a second material comprises ejecting a second binder.
6. (Original) The method of claim 4, wherein providing a second material comprises providing a powdered build material into which the first material is ejected.
7. (Original) The method of claim 3, wherein ejecting a first material comprises ejecting a solidifiable build material.

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8. (Original) The method of claim 7, wherein providing a second material comprises ejecting a solidifiable support material.
9. (Original) The method of claim 2, wherein causing a reaction to precipitate the colorant out of the first material comprises causing a pH reaction.
10. (Original) The method of claim 9, wherein the colorant in the first material is sensitive to pH, and wherein causing a pH reaction comprises providing a second material having a pH sufficiently different from a pH of the first material to cause the colorant to precipitate out of the first material upon contact of the first and second materials.
11. (Original) The method of claim 10, wherein the pH of the second material is lower than the pH of the first material.
12. (Original) The method of claim 11, wherein the colorant in the first material is a dye selected from the group consisting of carboxylated azo dyes, carboxylated copper phthalocyanine dyes, carboxylated xanthene dyes, and dyes whose solubility decreases as pH is lowered.
13. (Original) The method of claim 10, wherein the pH of the second material is higher than the pH of the first material.
14. (Original) The method of claim 10, wherein the pH differential between the first material and the second material ranges from about 2.5 to 7 units.
15. (Original) The method of claim 2, wherein causing a reaction to precipitate the colorant out of the first material comprises causing an anionic-cationic reaction.
16. (Original) The method of claim 15, wherein the colorant of the first material is anionic, and wherein causing a reaction comprises providing a cationic second material to

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cause the colorant to precipitate out of the first material upon contact of the first and second materials.

17. (Original) The method of claim 15, wherein the colorant of the first material is cationic, and wherein causing a reaction comprises providing an anionic second material to cause the colorant to precipitate out of the first material upon contact of the first and second materials.

18. (Original) The method of claim 1, wherein the colorant is a dye.

19. (Original) The method of claim 1, wherein the colorant is a pigment.

20. (Withdrawn) A solid freeform fabrication system for producing a desired object, the system comprising:

a fabrication chamber; and

an ejection apparatus for distributing successive layers of ejected material in the fabrication chamber to form the object;

wherein the ejected material contains a colorant that precipitates out of the ejected material and remains near a surface of the object.

21. (Withdrawn) The solid freeform fabrication system of claim 20, wherein the ejected material comprises a first material containing the colorant and a second material, the first and second materials reacting to precipitate the colorant out of the first material.

22. (Withdrawn) The solid freeform fabrication system of claim 21, wherein the colorant is sensitive to pH, and wherein the second material has a pH sufficiently different from a pH of the first material to cause the colorant to precipitate out of the first material upon contact of the first and second materials.

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23. (Withdrawn) The solid freeform fabrication system of claim 21, wherein the colorant is anionic, and wherein the second material is cationic, such that the colorant precipitates out of the first material upon combining the first and second materials.

24. (Withdrawn) The solid freeform fabrication system of claim 21, wherein the colorant is cationic, and wherein the second material is anionic, such that the colorant precipitates out of the first material upon combining the first and second materials.

25. (Withdrawn) The solid freeform fabrication system of claim 21, wherein the first and second materials comprise binders.

26. (Withdrawn) The solid freeform fabrication system of claim 20, wherein the ejected material comprises a binder.

27. (Withdrawn) The solid freeform fabrication system of claim 26, further comprising a powdered build material in the fabrication chamber into which the binder is ejected.

28. (Withdrawn) The solid freeform fabrication system of claim 27, wherein the colorant in the binder is sensitive to pH, and wherein the powdered build material has a pH sufficiently different from a pH of the binder to cause the colorant to precipitate out of the binder upon contact of the binder and the powdered build material.

29. (Withdrawn) The method of claim 27, wherein the colorant in the binder is anionic, and wherein the powdered build material is cationic such that the colorant precipitates out of the binder upon contact with the powdered build material.

30. (Withdrawn) The method of claim 27, wherein the colorant in the binder is cationic, and wherein the powdered build material is anionic such that the colorant precipitates out of the binder upon contact with the powdered build material.

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31. (Withdrawn) The solid freeform fabrication system of claim 21, wherein the ejected material comprises a solidifiable build material.
32. (Withdrawn) The solid freeform fabrication system of claim 21, wherein the ejection apparatus comprises a drop-on-demand liquid ejection head for ejecting the ejected material.
33. (Withdrawn) The solid freeform fabrication system of claim 32, wherein the drop-on-demand liquid ejection head for ejecting the ejected material includes a plurality of nozzles for ejecting the material.
34. (Withdrawn) A system for producing a desired object by solid freeform fabrication, the system comprising:
 means for building a series of successive cross-sections of the object from a build material to form the object; and
 means for maintaining a colorant near a surface of the object to produce a desired coloring of the object.
35. (Withdrawn) The system of claim 34, wherein the means for maintaining comprise precipitating the colorant out of the build material.
36. (Withdrawn) The system of claim 34, wherein the means for maintaining comprise a pH sensitive colorant in a first component of the build material, and a second component of the build material having a pH sufficiently different from a pH of the first component to cause the colorant to precipitate out of the first component upon contact of the first and second components.
37. (Withdrawn) The system of claim 36, wherein the first component is a binder, and the second component is a powdered build material.

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38. (Withdrawn) The system of claim 36, wherein the first and second components comprise binders.
39. (Withdrawn) The system of claim 34, wherein the means for maintaining comprise an anionic colorant in a first component of the build material, and a cationic second component of the build material, such that the colorant precipitates out of the first component upon combining the first and second components of the build material.
40. (Withdrawn) The system of claim 39, wherein the first component is a binder, and the second component is a powdered build material.
41. (Withdrawn) The system of claim 39, wherein the first and second components comprise binders.
42. (Withdrawn) The system of claim 34, wherein the means for maintaining comprise an cationic colorant in a first component of the build material, and a antionic second component of the build material, such that the colorant precipitates out of the first component upon combining the first and second components of the build material.
43. (Withdrawn) The system of claim 42, wherein the first component is a binder, and the second component is a powdered build material.
44. (Withdrawn) The system of claim 42, wherein the first and second components comprise binders.
45. (Withdrawn) The system of claim 34, wherein the means for building comprise means for selectively ejecting binder into a powdered build material.
46. (Withdrawn) The system of claim 34, wherein the means for building comprise means for selectively ejecting a solidifiable build material.

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47. (Withdrawn) The system of claim 46, wherein the solidifiable build material is a polymer or pre-polymer.